

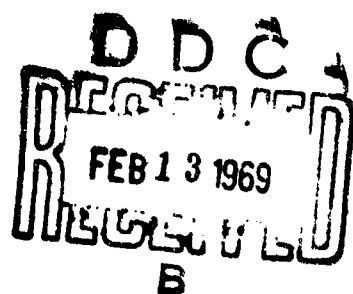
TISA PROJECT REPORT No. 23

**THE ROLE OF THE LIBRARY
IN RELATION TO
OTHER INFORMATION ACTIVITIES**

A STATE-OF-THE-ART REVIEW

**ANN F. PANTER
GRADUATE LIBRARY SCHOOL
INDIANA UNIVERSITY**

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16. Abstract Traditionally the library has been the repository of printed information and has assumed the responsibility for its acquisition, processing, storage and dissemination. Since World War II, and more particularly in the last ten years other information activities have largely taken over some of the old functions as well as adding some new functions. The purpose of this state-of-the-art review is to establish on the basis of the literature the role the library plays in relation to these other information activities in the Federal Government and perhaps shed some light upon the reasons for the development of separated facilities. Some of the characteristics investigated include definitions, functions, objectives, organization, financial base, services, personnel, and the user. A two part bibliography (alphabetical and classified) supplements the text.			
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ABSTRACT

Traditionally the library has been the repository of printed information and has assumed the responsibility for its acquisition, processing, storage and dissemination. Since World War II, and more particularly in the last ten years other information activities have largely taken over some of the old functions as well as adding some new functions. The purpose of this state-of-the-art review is to establish on the basis of the literature the role the library plays in relation to these other information activities in the Federal Government and perhaps shed some light upon the reasons for the development of separate facilities. Some of the characteristics investigated include definitions, functions, objectives, organization, financial base, services, personnel, and the user. A two part bibliography (alphabetical and classified) supplements the text.

FOREWORD

This state-of-the-art has been conducted as Phase I of an investigation of the Federal Library Committee, Task Force on the Role of Libraries in Information Systems. The major purpose of the study has been to identify certain elements in the published, and some unpublished, literature which will help define the role the library plays. The work has been performed under arrangement with the U.S. Army, Office of the Chief of Engineers, Army Technical Library Improvement Studies (ATLIS). Considerable assistance has been received from Charles Gottschalk, Chairman of the Task Force, Paul Howard, Executive Director of the Federal Library Committee, as well as the members of the Task Force. Some invaluable bibliographical assistance was provided by Margaret R. Fox, Chief, Technical Information Exchange, Institute for Applied Technology, National Bureau of Standards. Special assistance in searching for and accumulating information has been given by Mona Anderson and Alice King, graduate assistants, Graduate Library School, Indiana University. The manuscript has been prepared for submission by Toni Brugger and Nancy Pierce.

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I. INTRODUCTION

A resolution of Congress on September 23, 1789 stated "...duty of the Secretary of State to procure, from time to time, such of the statutes of the several states as may not be in his office." (73:262)** Such resolution came hard on the heels of the bill passed establishing the Department of State itself under the new Constitution and listing among the responsibilities of the Secretary the safekeeping of all records, books, and papers of the Department. It was this detailing of responsibility which provided the legal authority for the first of our Federal libraries. (23:28) The War Department followed suit and in 1800 were still the only two such repositories of information.

In the ensuing years the variety and number of federal special and research libraries continued to grow until today they reach well over 600 and range over the entire United States. They are distributed among the three branches of government, the Legislative, the Judicial and the Executive, with the majority in the latter. In general the rise of federal libraries is patterned upon the growth of the agencies and reflects their interests and needs. As a result they must vary in authority, organization, objectives, etc. hence there is no precise statement of what a federal library is.

Other information activities within the federal agencies is a somewhat anomalous expression covering a strange assortment of things from publishing activities to information booths. Despite the height of interest in such activities in recent years, they have almost as extensive a history as the libraries. Simpson, in an article on scientific information centers, has unearthed 13 such centers started in the 19th century all but one being federally or state supported. He has estimated that an average of seven per year have come into being since 1940. However, the greatest rise appears since 1946. (167:45) The word today has become information center, data center, clearinghouse rather than library.

Many have hypothesized both orally and in writing the whys and wherefores of the library versus the information center and its relatives. The trend away from libraries toward the newer forms appears overwhelming. But no one has yet established either for libraries in general or for federal libraries in particular just why the schism. In order to plan for the future needs and structure of the federal information community, the Federal Library Committee, established in 1962, has commissioned a Task Force under the direction of Charles Gottschalk, Atomic Energy Commission, to try and establish the interface between the federal library and the other information activities within the federal agencies.

The mission of this task force has four objectives: 1) the consideration of the current role of federal libraries in relation to other information elements in government (particularly the information center);

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Numbers appearing in parenthesis are keyed to the Bibliography, Part I at the end of the report, the number after the colon is the page number, e.g. (167:45) represents Simpson, p. 45.

2) the evaluation of the relationship between the two; 3) the review of factors or components within the relationship; and 4) the consideration of the components of a total system. Four immediate objectives have been defined in regard to the first item stated: 1) describe the role of the library by de facto analysis; 2) define the library and information center (system) based on its role; 3) determine the adequacy of the definition by looking at the factors; and 4) design a system based on the definition.

The scope of the entire investigation must include the history of both libraries and information systems both past and present. Basic information is needed on the organization and administration of existing programs. In order, however, to properly evaluate, indeed in some cases derive, such information it is necessary to understand the situation as it exists today. The purpose of this investigation (Phase I) is to determine the present role of the federal library through the published and in some cases unpublished literature, i.e. a state-of-the-art report and bibliography.

It is very difficult to determine the status of a concept such as "the role". Role is evaluated usually in terms of influence on and acceptance of an object but rarely an idea. It is a qualitative and not a quantitative measure, derived from impressions, interpretations, and opinions.

The role of an institution such as a library or an information center may be determined in several ways. These have been explored in the literature and their summations constitute the fabric of this report. One of the major aspects which help define "role" are the definitions of the institutions themselves, the library, the information center, a data center, a documentation center, etc. Another aspect of importance is the function or procedural activities of the institution, e.g. in the case of libraries and information centers, acquisition, processing, selective dissemination, etc. The third aspect is that of stated purpose and objectives as expressed perhaps in mission statements. A fourth constitutes what might be labeled as characteristics of the systems themselves, such as, general descriptions of operations, the authority, the organization and administration, the financial structure, materials, and personnel. And finally the most important of all the user, the client, the customer both actual and potential and his needs, satisfactions, and demands or desires become the ultimate determinants of role.

Another avenue is briefly explored but is more an application of the role in the future rather than the present. This avenue is that of the network, the system, the national system which has concerned the librarian, the documentalist, the information specialist in recent years. Literature in this area, however, does reflect an estimation of the present role of the library and the information center.

Since the primary interest of the Federal Library Committee lies in the area of federal agencies, the scope of the proposed review will limit itself almost exclusively to the federal library-information center community. Basic definitions, some functions and characteristics will of necessity come from the special libraries and information activities of

the university-industrial research field, but since many of these are federally supported in one way or another, they technically fall within the scope. It is nearly impossible to isolate the federal system from the non-federal in many cases since information and its transfer does not respect such artificial boundaries. There will be a noticeable attempt to avoid the non-federal organizations.

Both libraries and information centers-systems within the federal government may be classified as "special" since most are primarily oriented either to a particular discipline, such as medicine or agriculture, or to a particular mission, such as the control of drug information or missile technology. The classic exception to this is of course the Library of Congress, the largest of our general research libraries. Interest and development has come not exclusively but primarily in the scientific and technological fields. This may be a result of the concentrated concern of the entire government since the Second World War and Sputnik to keep up and surpass in technological endeavor. The war efforts automatically foster this type of development. Most of the information activity of the federal government today is scientific and technological in nature. There is thus another self-imposed limitation to the scope of this review.

Another somewhat self-imposed limitation is geographic. Washington, D.C. and its immediate environs has always been the focus of federal library activities although in recent years several of the departments have established branches, regional centers, etc. in other parts of the country. This study will remain primarily concerned with the Washington area taking into consideration only those libraries or centers outside these boundaries which constitute part of an established network.

Most of the libraries within the federal complex have long histories. Many were established during or just after the Civil War, but the information center concept is relatively new - post World War II, in fact a creation of the last decade. This complicates considerably a review of the role of the library in relation to the center as far as time span is concerned. One cannot ignore the authority on which the libraries were established nor the functions on which they base their operations, and hence there must be some review of the literature of the period of establishment. On the other hand, in order to investigate the relationship with the information center only the most recent literature is of value. In this review, therefore, the emphasis will be on the period of 1955-1967, but when presenting several aspects such as those mentioned above, an effort has also been made to go back into the early history of several of the more prominent libraries.

In summary, therefore, the purpose of this state-of-the-art review and bibliography is to determine from the literature the role of the library in relation to other information activities in federal agencies based in the Washington, D.C. area which deal with scientific and technological information within the last 10 years. This may appear to be severely delimiting but actually the bulk of the state-of-the-art resides within these parameters anyway. What can be determined within these bounds is a reasonably reliable base on which inferences can be made of the total complex.

Analysis and interpretation of the data reveals that the state-of-the-art places the library as a major element within a more comprehensive network or system, that the nature of the information handling problem has become so complex and the demands so varied that no one element can hope to provide total service and control. Thus the responsibilities must be divided among the library, the data center, the information center, the clearinghouse, the abstracting service, the distribution center and the referral center, each with fairly clearly defined purpose, functions and services.

II. CHARACTERISTICS OF THE LITERATURE

The value of any state-of-the-art rests in the quantity, and quality of the literature on which it is based. As pointed out before the role of an institution such as a library is a nebulous concept in itself and hence is even more difficult to pinpoint in the literature. This may be readily validated by looking at the bibliography which accompanies the report. This bibliography of some 200 items is the product of a culling process which began with an estimated 800 citations already indicating some pertinence. Rarely was an entire item of value, and usually only a sentence, a paragraph or actually an implication was worthy of note.

In regard to the type of material, the investigator will find that histories of federal libraries are few and far between, the major efforts being a publication of the U.S. Bureau of Education in 1876 entitled Public Libraries in the United States of America (179) and much later in 1957-58 a series of histories issued in Library Quarterly. This is not to say that pieces of such material cannot be gleaned from other sources but rather that these two represent major compilations. There is no equivalent source of histories of information centers, etc., with the exception perhaps of a dissertation or two such as R.M. Doutherty's on the Chemical-Biological Coordination Center. (70) This may be partially ascribed to their recent establishment but the lack makes comparison very difficult.

By far the greatest volume of literature falls into the category of general descriptions which usually start with the authority establishing either the library or information center, followed by the functions, then the services and a particular unique operation. One of the best of the examples of this type of reporting is the series produced by the National Science Foundation, Scientific Information Activities of Federal Agencies. (193) This is extended a bit by its series Non-conventional Technical Information Systems in Use which is quite different in intent and purpose and is oriented primarily to a description of the operational internal processing systems. Many of the periodical articles which result from conference speeches fall into this category. Most of the material is valuable merely for informational or awareness purposes but lacks the specificity to shed light on the role or relationship of libraries and other information activities.

A third type of material is the many operations studies or systems analyses. For the most part these did not prove to be particularly useful. The concern of the review was for function rather than operational procedures and while the latter should reflect the former, it is extremely difficult to establish role and relationship from operational programs and designs without superimposing considerable personal interpretation and opinion. This was true of systems analyses of both libraries typified by the National Agricultural Library Project ABLE report, or MEDLARS and those of information center or automated library programs many of which represent only wishful thinking or proposed systems. Most of this literature was consulted but rarely used.

A final class of material includes those items which specifically treat the concepts and theory of the library and information center which would of course dwell at considerable length on the role, functions, etc. This material is practically non-existent and almost if not all of it deals with special libraries and information centers outside the federal government and can be of value for this study only through interpolation.

Of the four major physical formats of information, monographs, periodical articles, report literature and government documents, the latter two proved to be the backbone to the study, particularly for information regarding the information/data center. The material is still fairly hard to find because of the lack of satisfactory indexing and abstracting services. The variety of bibliographic sources is reflected in Part II of the bibliography at the end. Each is oriented to one special type of material, e.g. Library Literature is primarily for periodical articles in library science, Documentation Abstracts covers periodical articles, some monographs, and some report literature, United States Government Research and Development Reports covers the report literature. Thus in order to be comprehensive as many sources as possible had to be reviewed. One item of particular value, without which the investigation might have failed, is the bibliography of holdings produced by the Research Information Center and Advisory Service for Information Processing (RICASIP) at the National Bureau of Standards. This collection has been accumulated since 1962 to support state-of-the-art research and review. Thus it constitutes one of the best collections of materials in information science, computer technology, computer design, library science primarily non-monographic in existence. Unfortunately financial support for the Center waivered during 1965-7 and there are gaps in coverage during this period, but otherwise it is unsurpassed.

One of the major sources of information which proves of value in determining role, function, service, etc. is unpublished reports, memos, requests for proposals and the like. This material is extremely difficult to obtain for general review, but it exists and often is more valuable than any printed source. There has been some reliance on this material but for the most part the use of such material will be relegated to the second phase of the Task Force Project since it requires contacting and interviewing personnel within the library-information center activity.

A final source of information which often provides an insight into the original design and implies role that an institution is expected to serve, is the laws, directives, mission statements, etc. issued by federal agencies. This report covers a number of the most important as they have been cited in the literature and compiled in the U.S. Statutes at Large. (198) For the majority, however, this is an untapped source. It was not tapped for several reasons. Initial sampling indicated that most of the directives were extremely broad in design and statement and offered little by way of defining either the role of the library or its relationship to other activities in fact the library specifically is rarely mentioned. The second reason lies in the fact that for the return expected, such searching would require considerable time and effort and it has just been done by the Federal Library Committee. However, it will not be available until August 1968 from R. R. Bowker (Guide to Laws and Regulations on Federal Libraries) or the U.S. Army, Office of Chief of Engineers.

Three specific reports have been prepared in recent years which relate very closely to the topic of discussion in this report. The first of these is a document prepared by the staff of System Development Corporation for the Committee on Scientific and Technical Information (COSATI) Task Group on National System(s). (41,42) It has been published as a 3 volume report and is available from the Clearinghouse and as a monograph available from Wiley in New York. It is entitled National Document-Handling Systems for Science and Technology. (1967) At the initial glance this document might seem to be an almost identical study with the one proposed here and indeed it contains many of the same elements treated in more depth. The preface states "The emphasis of the study as stated by COSATI is as follows: '1. Initial and primary priority will be placed on national systems relating to scientific and technical documents, their handling and the management of such documents. Specific matters to be reported on will include the current organizational and functional situation in the United States; the extent to which known deficiencies are causing a reduction in the potential for technical effectiveness ...; the alternatives which are available and economically feasible ...; and one or more action plans ...'"

As is indicated above the report is thus oriented (if it does not assume) to the concept of the national system, to the analysis of the organizational and operational aspects of the scientific information handling, and not to the role of one part of the system such as the library or its relationship to other parts. Such information may be implied and the data collected may be used in support of this concept but it is not the intent of the report. Considerable emphasis is of course placed on the definition and establishment of a national system, with three specific alternatives proffered. Thus for the purpose of this state-of-the-art the first part "Description of the Present System" is the most pertinent.

The second item of importance is a Survey and Analysis of Specialized Science Information Services in the United States prepared by Battelle Memorial Institute for the National Science Foundation in September 1962. (17) While it may be considered out of date when compared with the explosive creation of such services in recent years it does make a significant contribution by compiling and isolating data on seven topics: History, types of services and user groups, subject coverage, personnel and staffing, critical problems, methods of communication and support. Interpretation of the data is supplied. Here, as in the SDC report, the intent is not to define role or concept, not to separate library from center but rather to describe the characteristics of services. Thus it offers a valuable data base on which to work. Its major drawback lies in the date of compilation.

The Battelle study concludes with these observations: "One of the objectives of the research was to attempt to obtain data that could help establish definitions. Meaningful definitions were sought for terms such as information services, analysis centers, information centers, evaluation centers, research centers, research projects, and others. Meaningful definitions could not be derived because, although the data regarding staffs and services provided by the respondents were quite similar, their organizational names varied without pattern."

"When comparing the activities of those specialized information services contained in the Directory with libraries and other information services, it appears that a pattern of functions of various science information services can be identified. There is no clear-cut differentiation among any of these services and the degree of mix in activities is significant."

Before discussing the third document, mention should be made of another study of specialized information services which is complementary to the above. This study was conducted by J. Ferguson of the Bureau of Applied Social Research, Columbia University in 1965. It is entitled Specialized Social Science Information Services in the United States. While this study covers a subject area excluded from the present state-of-the-art it is particularly valuable in the techniques used in the survey and the interpretations of the data compiled. Its interest is also a conceptual one and not merely descriptive and the final chapters are concerned with "topology of information organizations." This study thus comes closer to providing the conceptual framework, indicating the role and relationships of the parts. The topology distinguishes the following types: libraries, museums, research organizations, statistics organizations and service organizations. It was used to distinguish services performed, purposes of organizations the publics' using information services, problems of everyday operation, types of changes envisioned and new services the respondents would like to see. The classification will cover not only those specialized information services in the survey but other information sources such as translation and abstracting services, and any other type of information source which is used in academic and scholarly disciplines. This is a further requirement of a topology, that it be comprehensive, as well as consistent. For example, it should be possible to locate Simpson's information center (see discussion under chapter on definition) in the topology as readily as a general library. This is a very interesting discussion and warrants consideration by anyone trying to compare, relate and define information centers-systems and other activities regardless of discipline.

The third report which helps to supplement this review has been prepared by Melvin Weinstock and Saul Herner, Herner and Company, Characteristics of Information Systems as Revealed by an Analysis of Data in the National Science Foundation's Series NONCONVENTIONAL SCIENTIFIC AND TECHNICAL INFORMATION SYSTEMS IN CURRENT USE, NO. 4. (96) While this study covers many non-federal activities the techniques and characteristics developed apply readily to deriving data for this review. Weinstock and Herner of course are using the term system in a slightly different sense than most of the other materials cited in the following review; they use it in a much narrower sense as parts of libraries or technical information centers. Some of the evaluative criteria are the same regardless and will prove valuable to any studying systems whether internal, as in the Herner study, or external, as in the SDC study.

Plan of approach: As was indicated in the introduction the determination of the role of the library comes from several sources most of which are implied. It is the intent of the rest of this report to explore several of these facets: definitions, functions, purpose and objectives, characteristics of the systems, and the users. This will be followed by a summary of the important factors.

III. DEFINITIONS

"Information is an agency resource, a federal, national, and international resource.

Modern information technology has made it possible to place much of the accumulated knowledge of the human race within the reach of man's fingertips, so to speak. The potentialities of this access to power are awesome, in terms of improving the well-being of our own and other people, as well as in terms of an improved education for young and old alike.

If man's collected knowledge is to become truly accessible, plans and programs must be made, priorities assigned and resources allocated."

This excerpt from a report of the Committee on Government Operations, United States Senate, June 24, 1965 introduces the SDC study of national document handling systems. (41:1) It serves the same purpose for this state-of-the-art in that it both states and implies the various aspects from which the role of the library and information center must be viewed. One of the basic problems of course is the nature of information itself. Information may be defined in terms of both format (books, film, data, etc.) in which it appears, and by the user in terms of its satisfaction of his needs or answer to request. The first provides an indirect access and the second comes from a more direct access to the content of physical materials.

For many years the world has viewed information in the form of a book, the printed word, altering it somewhat from the hard-backed variety to include pamphlets, documents and other paper-bound versions. Even today the vast majority of the information seeking community thinks in these terms. It is upon this concept that the library has established itself and grown. So well imbedded is the idea of the document, the physical object, that even in considering the information center within the last five years the various elements of information handling have basically separated themselves in terms of format of the material that they handle. Hal Borko in describing the conceptual foundations of an information system explains "... an information system consists of a collection of recorded information, custodians who organize and maintain the collection, the retrieval procedure, and the users who refer to the information to satisfy a variety of needs. As this definition implies there is a great deal of similarity between a library and an information system with a collection of documents, a characteristic method of organization and maintaining the collection, and a designated set of users. In contrast, an information system refers to a more generalized complex of functions." (31:5) This statement in itself assumes a basic difference between the library and the information center-system.

Thus essentially information is defined in two terms, data or documents, facts or citations, and a tremendous range of services and centers have developed to supply them. The institutions and agencies

responsible for them have been labelled: libraries, special libraries, information centers, data centers, information analysis centers, data analysis centers, documentation centers, clearinghouses, referral centers, information exchanges, and publication, announcement and distribution organizations. Some of these also generate information as well as process it. One can find distinctions in their definitions but in operations many similarities and overlap.

What precisely is a library? For an institution which is so much a part of the information community the lack of a definition is somewhat appalling. Generally, it has been defined by what it is not. The Federal government has among the ranks of its libraries the three of the largest in the country, Library of Congress, the National Agricultural Library and the National Library of Medicine. Two of these have been designated "national libraries" the other acts as one. Licklider in his Libraries of the Future (120:1) explains very carefully what he is referring to: "The 'libraries' of the phrase 'libraries of the future' may not be very much like present day libraries, and the term 'library' rooted in 'book' is not truly appropriate to the kind of system on which the study is focussed. We delimited the scope of the study ... to functions, classes of information, and domain of knowledge in which the items of basic interest are not the print of paper, and not the words and sentences themselves - but the facts, concepts, principles, and ideas that lie behind the visible and tangible aspects of documents." As can be seen Licklider is including both data and document in his definition. This is not however the conventional definition for library.

Some authorities such as Dwight Gray (88:332) using the term 'libraries' find that it is really only a label and try to put both conventional libraries and documentation centers under one umbrella. This is not however a common occurrence. Most go out of their way to separate libraries from the rest. Yet few if any take the opportunity to define the 'library'. This is true even in the several tomes which have dealt almost exclusively with the Federal library as opposed to the information of document center (Library Trends July 1953, Library Quarterly 1957, 1958 and Orlans, H. Federal departmental libraries, 1963.). Part of the problem of definition of federal libraries may reside in their rather haphazard establishment in many cases. As Luther Evans points out in the Orlans report (144:3) "In most cases the jurisdiction of a new agency has been defined without reference to the maintenance of a library. Rarely has an agency defined the function of a library..." The closest attempt at such definition has been made by the Federal Library Committee in stating the Federal library mission. The definition consists primarily of responsibilities: "Federal libraries support the missions of their agencies principally by providing bibliographically related information services. To achieve this objective they have at least four basic responsibilities: a. to collect and organize pertinent recorded information ...; to provide ready access ...; to disseminate pertinent information ...; to make their collections and services known ..." (77a:4)

The most modern and encompassing definition of a library is offered in a work for the National Advisory Commission on Libraries by DeWitt Myatt (158:26): "Libraries generally orient toward higher-tier intellectual

records. They collect, conserve, and sometimes disseminate, but normally do not manipulate the information elements of their collection. General consensus would support this particular view perhaps limiting it even more to a definition such as that of the study of the Select Committee on Government Research in 1964 (184:97). This is essentially a paraphrase of the Webster's Collegiate definition: "Library--a collection of books and similar material organized and administered for reading, reference, and study." The common understanding of what a library is lies somewhere within the range of these two.

We fare much better when it comes to a definition of an information center. The Weinberg report (195:3) indicates that the specialized information center is the major key to the rationalization of our information system. It should be primarily a technical institute rather than a technical library. The preface to the Battelle study for a transducer center (16:4) describes an information center as essentially an information brokerage. Kent in his text on Specialized Information Centers (115:23) defines a center, for his purposes, as any library or collection of documents which serves more than one or a few people.

But the definition most often offered is that of G.S. Simpson in his Scientific Information Centers in the U.S. (167:43): "A scientific information center exists for the primary purpose of preparing authoritative, timely, and specialized reports of evaluative, analytical, monographic or state-of-the-art type. It is an organization staffed in part with scientists and engineers and to provide a basis for its primary function, it conducts a selective data and information acquisition and processing program".

The definition supplied by the previously mentioned government study group (184:99) expands this definition considerably: "technical information center - An organization for acquiring, processing, and disseminating technical information. A technical information center may include a library; a staff of scientists and engineers for extracting, indexing, and evaluating technical literature; facilities such as centers for documentation, referral, and information evaluation; a roster of consultants on call; and capabilities for writing reports, handbooks, and reviews including the application of the graphic arts to their production." This latter definition defines a national system more closely than a single center, although the SDC study on national document handling systems (41) agrees that a library may form part of an information center.

Another level of specificity is expressed in the development of the information analysis or data evaluation center. Dugger (71:28) defines the analysis center as one which makes selective acquisition of scientific and technical data in its field of speciality, reviews it, evaluates and analyzes it, has a system for the storage and retrieval of it, and disseminates it in a different way dependent upon the desires of the users. Simpson (167) expands this somewhat by explaining that "centers are based on the assumption that the transfer of information is a more complex transaction than the acquisition, storage and retrieval of documents or surrogates thereof. It is assumed that the essential problem lies in the organization and evaluation of information rather than storage

and retrieval. The center is devoted to the task of reducing, analyzing, and shrinking to manageable proportions large volumes of information." E. Brady (189a:2) develops a composite definition out of three groups of functions: "An information analysis center is a formally structured organizational unit specifically (but not necessarily exclusively) established for the purpose of acquiring, selecting, storing, retrieving, evaluating, analyzing, and synthesizing a body of information in a clearly defined specialized field or pertaining to a specified mission with the intent of compiling, digesting, repackaging, or otherwise organizing and presenting pertinent information in a form most authoritative, timely, and useful to a society of peers and management."

The clearinghouse, a term only recently applied to information activities, is somewhat indefinite. The literature indicates two possibilities: William Hammond in the 2d Conference on Information System Sciences (52:292) labels both the National Referral Center and the Science Information Exchange as clearinghouses. The Weinberg report (195:32) states that a centralized document depository is primarily a clearinghouse for documents and does not try to glean information from the documents. Kingsbury Jackson (109) labels this a documentation center, and the name of the major documentation activity in the federal government for report literature would support this definition, i.e. the Clearinghouse for Federal Scientific and Technical Information. However, the consensus indicates that a clearinghouse collects and maintains records of research, developments, and engineering being planned, in progress or completed, but only refers to the source and does not supply either data or the document. Thus in many cases the clearinghouse is also similar to the referral center. There does not seem to be a clear-cut separation of these three in the literature.

There are two remaining information activities which must be included in our consideration. One is the indexing and abstracting service which is used primarily for announcement and control of the literature, and the other is the publication-sales service which for the most part does not deal with the intellectual content of the material at all. On the whole from examination of the literature these activities within the government appear to be part of the function of each of the above "centers" or "libraries" with the possible exception of the Superintendent of Documents and hence do not actually characterize separate entities. (41:59)

Definitions seem to vary tremendously from one person to another and rely very heavily upon the orientation of the individual. The major differentiations lie in function, input (types of information handled), and output (services). What do the definitions tell us about the role of the library? Very little, but several implications are present. These direct us toward a closer examination of the elements of the definitions: purpose, function, characteristics.

IV. PURPOSE - OBJECTIVES

Stated purposes and objectives of both libraries and information centers have reflected the role each expects to play in the total complex. Most of the purposes, missions, and objectives of the federal information activities appear in the laws, directives, instructions, etc. establishing either the parent agency or the activity itself. Objectives frequently appear in the form of projected functions. However, examination of statements indicate several broader aspects. The major objectives of the federal libraries are typified by such statements as appear in the Organic Act of 1862 "to acquire and diffuse among the people of the United States useful information on subjects connected with agriculture..." (193) or in title 2 of the USDA Administrative Regulations "Purpose: NAL is organized to serve the research, extension, regulatory and other programs of the Department and to serve others who require information which can be derived from specialized publications on agriculture and related fields." (193) But the primary purpose for which a federal library is used is to further the work of its agency through the provision of information needed in the conduct of business, to serve as an immediate instrument for the execution of the agency's policy and program, and to assist in the execution of that program through its morale building ability. It may also serve to demonstrate how library service supports government operations. (101:19)

The mission statements of the information center activities are much more specific and indicate the nature of most of them. They are apt to be mission oriented rather than discipline oriented in the sense that many of the federal library are. They introduce several interesting objectives: "to become a world center for research, and the collection, analysis, correlation and dissemination of thermophysical properties information and as such serve education, science and technology through a better knowledge in this area" (177:10); "to provide a source and means of retrieving technical data, to collect published and unpublished data and literature"; to identify and record 20,000 serial publications; to provide in one place titles ordinarily listed in the major libraries and special collections (25:95); need for centralization of government activities and collection and processing of climatological records (137:2); to coordinate related work under the auspices of all government agencies; to establish standards of quality for all products of the system; to establish standards of methodology (138:36); to provide national leadership in the development and use of accurate reliable technical information for scientists and engineers (176:29); identify select government sponsored research and development information to fit stated needs of civilian oriented industry. (5) An umbrella statement of mission and purpose was devised by a group at the Research Triangle Institute in North Carolina (100:8): "The mission of an information system is to expedite the flow and interchange of scientific information... The primary purpose of a scientific and technical information system is to enable the best use to be made of available information: a) by storing information in such a way that it can be retrieved in response to specific queries, b) by augmenting communication between scientists, policy makers, and operational planners."

With the library and the information center the objectives and purposes are fairly well outlined. The other information activities are not as detailed with the exception of the Clearinghouse, the Defense Documentation Center and the other essentially document processing organizations. The primary mission of DDC is to provide the efficient interchange of military research and development information among Defense and other U.S. Government agencies. It also cooperates with other documentation and information centers to insure that reports in its collections on which there are no restrictions are made available. (193) The Clearinghouse, based on the previously stated objectives of the Office of Technical Services has three major objectives: as a national center to assure the availability of government generated scientific and technical information including also information on foreign technical developments, to serve the scientific and technical community in government, industry, and the academic world, and to provide the dissemination of technical reports and translations and referral to more specialized sources of information.

The data centers' statement of objectives almost consistently are defined in terms of specific functions rather than overall objectives. The mission of the NBS Cryogenic Data Center for instance is to classify, code and store selected references for quick retrieval by the staff. (143:152) The Air Pollution Control Center's aim is to provide available answers to engineering problems concerning the measurement, effects, etc. of air pollution. (169:11) The NBS National Standard Reference Data Center intends to support a government wide effort to give the technical community optimum access to quantitative data and to promote the compilation of evaluative data. (138:36)

An activity which combines the elements of the data center and the clearinghouse ERIC (Educational Research Information Center) has the over-all goal of organizing the output of significant research, information and resources in education and providing access to information of specific interest. Their objectives include information analysis and organization as well as location and collection.

Thus as the information activity becomes more and more specialized the overall aims, objectives and mission become more and more specific and tend to emphasize the functions and services. What implication do the objectives have for the role of the library in relation to the information center, etc.? There is a great deal more than in the definitions. Most statements of objectives are designed to express indirectly the role of the particular agency, institution or organization. It is perhaps a hoped-for role indicated by such terms as: assist, serve, further, provide, coordinate, establish, promote, etc. Here again the role is expressed in reference to functions, to format (data, document) to materials, and it is implied. The role of the library if based on the stated objectives is essentially the same as that of the information center-system. The library is the source of materials, information, and service, provided from storage for the most part, but occasionally created.

V. FUNCTIONS

The term function has been used to mean many things. In regard to information activities it has ranged from over-all objectives to specific services, synonymous with activity. Actually a function is one or more activities, operations or procedures which make up a characteristic or purpose of an information system. Several references have already been made to function(s) in considering libraries and other information activities in both "DEFINITIONS" and "OBJECTIVES" for it seems that the only way to define or delineate these two is to express them in terms of function. Our characterization of each form of information activity in federal agencies has really been somewhat nebulous but when it comes to function the separation becomes quite clear and it is much easier to see the "role" of each and its relationship to the others.

Fine and Eaton (80:41) in a Library Trends survey of Federal library activity have interpreted function to mean resources and services and hence do not really touch upon the real differentiation between one type of library and another. They admit themselves that theirs is a "recital of resources and services" and in much of it are quite superficial. However, they do present one of the few historical compilations of the beginning of several characteristic functions. Among these are, allowing public access to library collections and the provision of inter-library loan (circulation) and reference service, as at the "Department of Agriculture Library, the Armed Forces Medical Library, and the Office of Education". Another unique function was created by the establishment of the National Archives to preserve the permanently valuable non-current records of the Congress, the White House, the executive departments, etc. and make them available to those with legitimate purpose. The whole system of depository libraries established by the Superintendent of Documents was one of the earliest of the publication and distribution activities (function). This function has been continued and expanded by federal agencies and also supplemented through another means, that of bibliographies and indexes to the literature or materials they acquire. Some of the most notable of these are the Bibliography of Agriculture, the Index Medicus (and its predecessors), the National Union Catalog (and its predecessors). Very closely related to this is a final function, that of making available as quickly as possible the results of scientific work being carried on by the government as demonstrated by the "Office of Technical Services, the Atomic Energy Commission, and the Armed Services Technical Information Agency (ASTIA)" now the Defense Documentation Center. As one can see this is a very selective historical treatment but they have included at the end, almost as an afterthought, a function outside of the traditional library scope.

Another survey of Federal libraries (144) approaches function in a more traditional sense, in fact the report is divided by function: acquisitions, weeding, cataloging and classification, reader services, inter-library cooperation. John Sherrod in a description of the activities of the science collection and services of the Library of Congress generalizes these somewhat to: 1) serve Congress, 2) collect materials, and 3) maintain a basic bibliographic control system. The National Agricultural Library responsibilities or functions include but are not limited to

acquisition, collection, translation, exchange and storage of scientific and technical materials and such related bibliographic and collective reference sources, and bibliographic organizing and processing including reviewing, translating, screening, cataloging, indexing, coding and filing. (106:3) Some of these by all rights would normally be designated services rather than functions but at least three of them, translation, exchange, and elements of bibliographic processing such as screening, reviewing and coding are unique and as we shall see are characterized as functions of information centers-systems.

Strauss, Strieby, and Brown (172:15) in describing the functions of scientific and technical libraries in general provide one of the clearer outlines which most of the Federal libraries adhere to. These include: develop a collection of books, periodicals and other publications, maintain special subject reference files and indexes, disseminate current publication information, circulate books, route periodicals, file and index reports and correspondence, provide reference service, compile bibliographies, act as editorial assistants, translate, and provide other personalized services.

In summary the functions of Federal libraries may be outlined as:

1. Collection - selection, acquisition, weeding, exchange.
2. Circulation - loan, interlibrary loan.
3. Processing - bibliographic control, cataloging, classifying, indexing, coding.
4. Reference - direct answer (bibliographic) to specified questions.
5. Special services - bibliography compilation, translation, photocopy.
6. Storage - maintenance of the collection.
7. Publication - limited to larger national libraries for the most part and to indexes and bibliographies of their holdings.

A great deal has been said and written on the topic of the function of the information center especially in contrast to the library and very careful distinctions are made. Alan Rees (147:174) in explaining why information centers are successful offers four points in regard to differences in function: 1) agreement of delegation on the part of the requester, 2) exercise of judgment and evaluation, 3) provision of information not documents, and 4) processing of the search output into a variety of search products. Essentially there is no basis for comparison, the library and the information center are laboring to do two different things. Here he is speaking on a much broader base in regard to function and also is orienting his discussion to all information centers and not just federal or non-federal.

Kent in his text on Specialized Information Centers (115:23-4) lists six functions: acquisition, analysis (indexing, abstracting, classifying), terminology control, record results of analysis on search medium, store, and output. Conrad (54:115) provides several more with little or no overlap: assist the user, obtain specific answers, provide referral service, interface with other centers, conduct surveys, provide current awareness, provide selective dissemination. Sherrod (164:34) reinforces the concept of serving the needs of its clientele but adds that the unique functions spring from operating procedures based on aggressive information collection and dissemination. Simpson (167:43) indicates that all scientific information centers acquire, store and retrieve, and produce. The acquisition function involves identifying what is important in the total information available and then obtaining it. The storage and retrieval function varies considerably because of the methods used, no single system satisfying all users. The production function concerns money. Money comes from the user for the service. Satisfaction is tied not just to economy but quality and efficiency of response. Some centers do more than just these three. They may also reduce and analyze data, analyze interpretive reports, or both. The Research Triangle Institute report (100) on the air pollution control center would add microreduction to this, as well as announcement.

On a more specific level, the Chemical-Biological Coordination Center (136:4) researched the problems of processing their data, assembled and organized data, acted or served as a repository, answered questions, and sponsored preliminary testing, sponsored and administered a chemical screening program, conducted symposia and published reviews. (70) The ED Branch of the Missile Command (Redstone) (109:80) serves as staff expert and advisor, provides ED requirements to project managers, reproduces this data into usable data sheets, provides means for retrieval, prepares needed handbooks, provides reviews and sources of current information on materials, answers technical questions, points out gaps in needed information, and improves information processing and communication procedures.

The emphasis is quite obviously on active use of the collection and the means of use rather than on the collection itself. Data and information are employed quite heavily almost giving the functions a flavor of the data center. However, in actuality, most information centers are still heavily collection oriented and while the literature will often dwell upon some of the more unique and glamorous functions and services, it is still document acquisition, processing, recording, storage and retrieval which characterizes the information center.

There has not been much of a current nature written comparing the functions of the library and the information center. The best is that of Murdock and Brophy (131) in Library Trends, January 1966. In this instance they are discussing all information centers and libraries and not just Federal ones. They take as an example, however, Battelle Memorial Institute which does have Federally supported information centers as well as libraries within the same organization, a rather unique arrangement but very useful for comparisons. The authors indicate that the basic difference lies in the scope of responsibility, a library providing material in many subjects, an information center specializing in one field. Another

difference is that libraries provide the user with information in its original format (books, journals, etc.) while the product of the center is an analysis, state-of-the-art. To illustrate this they have provided two charts, Figures 1 and 2, which graphically summarize the functions of an information center.

The data analysis or information analysis center has been devised with very specific functions in mind. The Defense Department Instruction No. 5100.45 July 28, 1964 (193) sets the framework for the most extensive network of these centers. Most of them are part of the federal framework, few if any exist outside. They constitute any functional element ... (that) collects, reviews, digests, analyzes, appraises, summarizes and provides advisory and other user services concerning the available scientific and technical information in a well-defined specialized field. They are concerned exclusively with the review or analysis of data. The Weinberg report (195:32) projected the need for such centers and felt that they might well become a central feature of the hierarchical reorganization of science. The report describes their function as the "systematic collection of data". Edward L. Brady (189a:2) defines three types of analysis centers by function:

"Information Analysis Center Type I:

First, there is the individual or group that collects the world output of useful information in a particular field of science or technology (including the social sciences), organizes and stores it for retrieval, then condenses, analyzes, synthesizes, or otherwise uses the information to create new knowledge.

Information Analysis Center Type II:

Second is the individual or group that collects the world output of useful information relevant to the solution of a set of problems encountered in achieving specific practical goals, organizes and stores the knowledge for retrieval, then analyzes the information to attempt to solve specific problems of interest to the community it serves, or to determine what additional information may be needed to solve the problem.

Information Analysis Center Type III:

Finally, third is the individual or group that collects raw or partially processed observational results concerned with large-scale phenomena, organizes and stores the information, then analyzes the results in order to obtain correlations, test theories, or otherwise produce new knowledge."

Dugger (71:29) in presenting his overview of information analysis centers points out one of the major problems of defining function. There are not two centers alike; the basic ideas may be the same but the methods of achieving them are different. Most of them have strong acquisition programs and the value of the service depends on this. Active acquisition has

SUMMARY OF THE FUNCTION OF AN INFORMATION CENTER

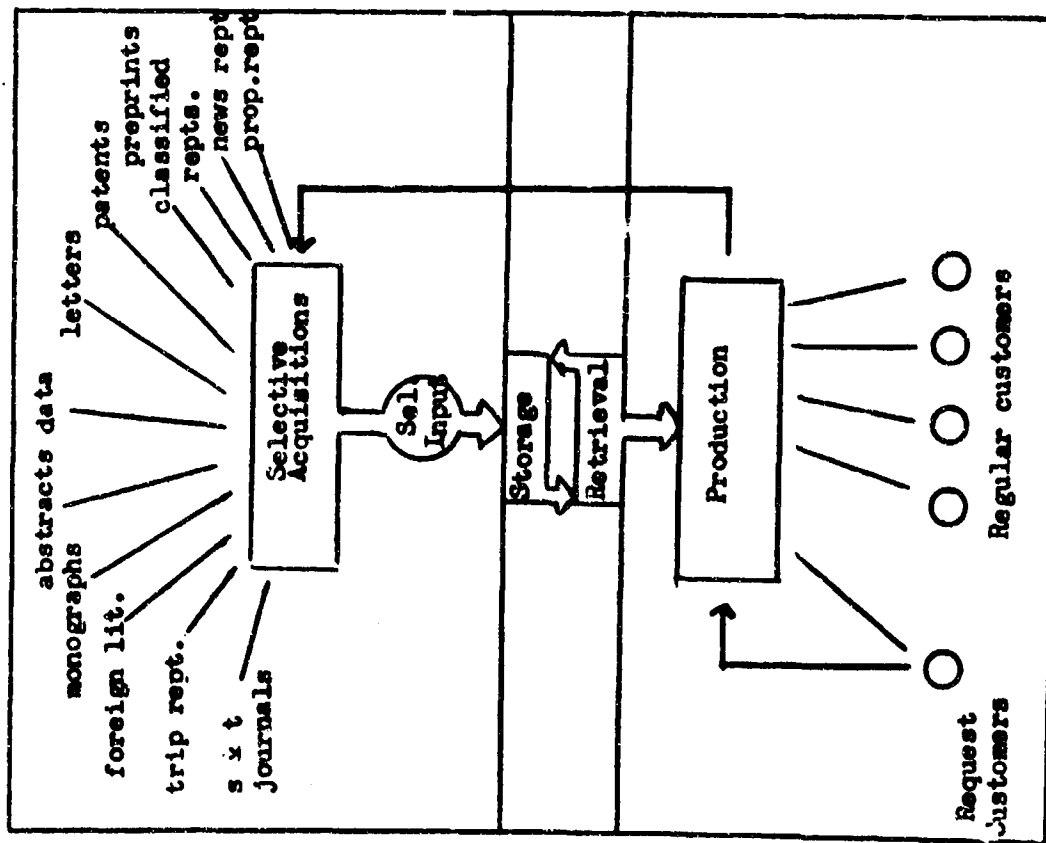


Figure 1 Primary Functions of a Scientific Information Center

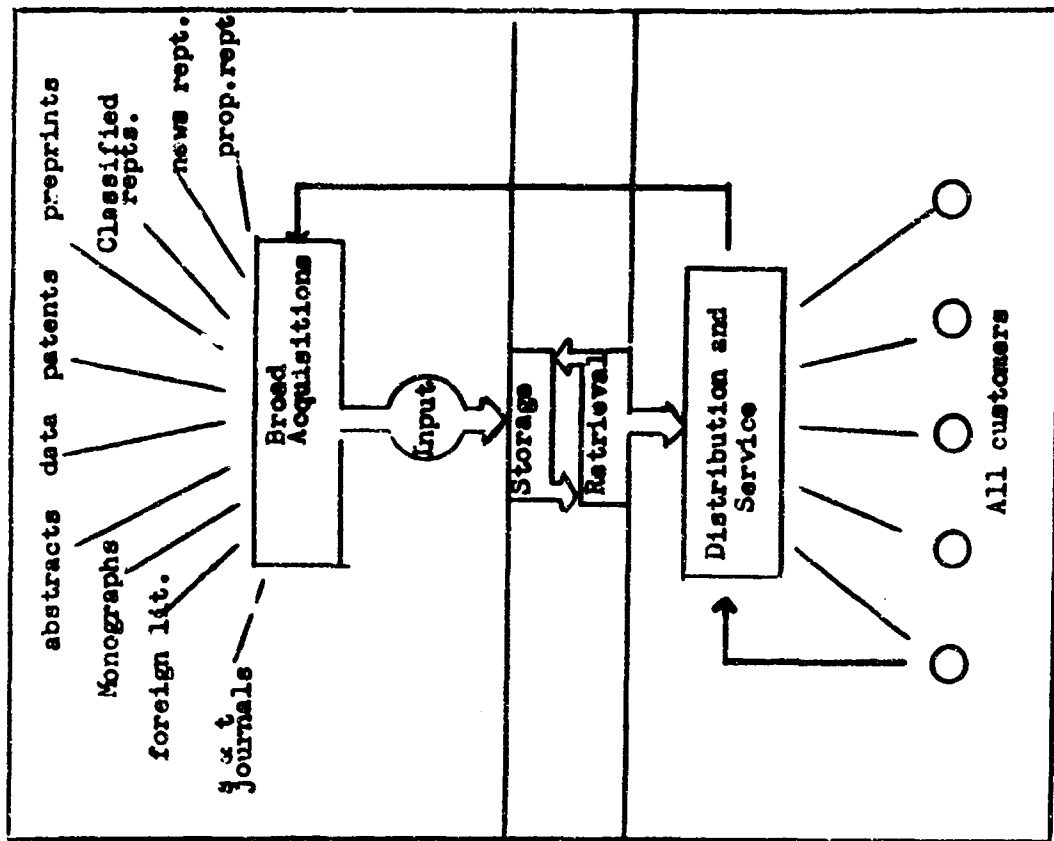


Figure 2 Primary Functions of a Library

seemed at times unrewarding. One center scans some 4 million abstracts a year and only 7,000 have proven to be pertinent. Evaluation of data or information distinguishes the analysis center more than any other factor from the conventional library or information center. Storage and retrieval varies in the same way as the levels of data evaluation and appears in many physical forms. Dissemination of data, another major function, involves direct response in the form of an answer to inquiries, state-of-the-art reports, data sheets and handbooks.

In 1965 some 113 information centers had been established, as part of the DOD complex. Their function statements include such as: "collects and disseminates information", "compiles data on ... serves as a reference center", "analyzes data on", "evaluation of data on", "prepares data summaries, tabulations, and atlases", "collects, exchanges, collates, develops, and evaluates technical data", "provides ready access to numerical data", "searches, codes, analyzes and disseminates". Brady (34:6) in describing one of the major projects involving data handling, the National Standard Reference System, presents its functions as coordinating and integrating existing data evaluation and compilation activities into a system; comprehensive programming to supplement and expand technical coverage, and when necessary, establish and maintain standards for output of participating groups and provide the mechanism for the dissemination of that output.

Essentially it appears therefore that the data and information analysis center is functioning the same way in regard to data and information as the more conventional library and information center in regard to documents. Item by item, or function by function, comparison would provide a summary very similar if not identical with that included under the previous section on libraries. The differentiation lies primarily in the form of output or service that is provided. Darby (56:92-3) brings in another factor or function which he feels distinguishes the analysis center, that of feedback. Conceptually the basic functions of an analysis center are those associated with a library or information system. However, he notes that the scope of acquisition in an analysis center is broadened and the concept of selective acquisition is important. There is no need to have the same information in the center many times merely because it appears several times. The information is required only once. One of the really differentiating factors is represented by the output or production of the analysis center. Instead of the traditional bibliography, abstracts, indexing, technical answers, data compilations and state-of-the-art reports are the products. Feedback controls the acquisition function. The nature of feedback is much different than in an information center or library where it takes the form of citations, bibliographies, etc. It is instead in the form of new technical information directed toward the solution of specific problems and it becomes an integral part of the acquisition function of the analysis center.

The documentation center (clearinghouse) has also developed some more specialized functions which separate it fairly decisively from the other information activities. Fry (46:2) in describing the Clearinghouse for Federal Scientific and Technical Information indicates four primary functions: document collection and distribution including other appro-

private materials such as drawings, patents, translations and data compilations; central information and alerting service including fast announcement, industrial referral and a technical literature search service; regional service through information packaging and field offices; and finally the translation program. Day (60:226) adapts this somewhat in his five operating principles of the National Aeronautics and Space Administration information activities: products and service design for the ultimate consumer; recognized need for timeliness; recognized need for cooperation and collaboration with others; minimum centralization; information too is designed for a variety of users. These govern the activities of three principle work areas, acquisition and bibliographical control, dissemination, and publication. These are all characteristic of the major defense agency documentation activities.

The other major clearinghouse function is that essentially of referral, the accumulation by a center of information on current research and development, people working in a particular area, management information of special projects, and sources of bibliographic assistance. Into this category of course falls the entire function of the National Referral Center, housed at the Library of Congress, the Science Information Exchange at the Smithsonian, and a whole string of clearinghouses established by the Office of Education under the label of the Educational Resources Information Center. While some of the collection and analysis functions overlap with other information activities, the referral function makes this a separate entity and a prime function.

Oatfield (141:134) indicates the scope of such function: "Current information activity both within and outside governmental agencies has created congeries of clearinghouses and referral centers. These services usually do not alert ... to new developments, but they provide them, on direct inquiry, with pertinent data or second referral to a fresh prime source of information at another location". Deignan (62: 584-5) expresses some of the same concepts in the discussion of the Medical Science Information Exchange. Its function is defined as: "the accumulation, organization, analysis and distribution of information concerned with current research in medical and allied fields." The Science Information Exchange is concerned only with records of research planned or actually in progress; it does not receive any form of research results, functioning primarily in compiling data and technical information for program management purposes.

The following matrix (Figure 3) is offered as a generalized summary and comparison of the functions of the federal information activities. The most prominent lesson seems to be that when removing functions from the labels of library, information center, etc. there are decided similarities, overlap, and perhaps duplication. The strict separation of function is apparently influenced also by the fact that the majority of Federal libraries are science oriented and informational demands have forced innovation upon the conventional library structure so that there is more overlap than in the non-federal community. We have not yet arrived at the "role" of each element but the distinction of function goes a long way toward providing guidelines for its establishment. It is

particularly noteworthy that one function has not been specifically given. This function is that of creative research, and it is detailed by the definition of an information center in the Weinberg report and in several of the Battelle Memorial Institute surveys: "should be primarily a technical institute rather than a technical library, led by professional working scientists and engineers in closest contact with their own profession". This particular function may be assumed in many of the discussions, especially those dealing with the data and information analysis center, and some specialized information activities such as the Army ATLIS program, but it is a decidedly unique activity quite separate from that of most libraries, and certainly deserving of more than an assumption.

FUNCTIONAL COMPARISON OF FEDERAL INFORMATION ACTIVITIES

FUNCTION	ACTIVITY						
	LIBRARY	INFO. CENTER	ANALYSIS CTR.	DOCUMENTATION CENTER	PUBLICATION	CLEARINGHOUSE	REFERRAL CTR.
Collection Document Data	x	x o	o	x o		x o	o
Processing Document Data	x	x o	o	x	x	x o	o
Storage Document Data	x	x o	o	x	x	x o	o
Retrieval Document Data	x	x o	o		x	x o	
Dissemination Document Data	x	x o	o	x o	x	x o	o
Publication Document Data			o		x		
Announcement Document Data		x o		x	x		
Information Generation Document Data			x o				
Service (Spec.) Document Data	x	x	o	x o		x	
Referral Document Data	x	x		x		x o	x o
Consultation & Advice in Discipline		x	x				
Archives	x			x			

x = Document

o = Data

FIGURE 3

VI. DESCRIPTIVE CHARACTERISTICS

While definitions, objectives, and functions provide an insight to the role of the library and its interrelationships with information centers-systems, there are other factors which help distinguish the various types of information activities that perhaps do not directly explain the role but rather describe how the latter grew outside the formal library structure. These factors, or influencing characteristics, include such things as the authority on which the organization was established, the financial base, the cost structure, history, materials, organization and administration, personnel, services, and the user himself.

Several of the surveys mentioned in the literature critique have specifically tried to identify and define these characteristics, particularly the SDC study (41) of document handling systems, and the Battelle survey (17) of specialized science information services. Booz-Allen has done several surveys (28-30) of DoD analysis centers in an effort to evaluate some of these characteristics; Herner has conducted others, primarily oriented to the user groups. Some of these concepts will be included with particular characteristics. However, there are several other factors which normally appear in introductions to the studies justifying or attempting to explain the complexities of the problem. SDC study recommendations for a system present some of these: the Federal government has the responsibility to ensure one accessible copy of each significant publication, has the responsibility to see that there is appropriate control making the world's literature accessible, must take into account all publications secondary as well as primary, non-document areas are a critical part of the system, information centers are a permanent part of the system, must cover a variety of users, there is a need for advanced technology and a concern over the proper derivation of a cost effectiveness ratio. The Research Triangle Institute study (100) includes such factors as acceptable lead time in announcement and availability, depth of service, type of files, form of the collection, the indexing method, and cost. Heckman (99:9) has divided the characteristics into two categories (numerical attributes and non-numeric) which he intended to be primarily for information centers but are equally applicable for the others. These include size of collection, rate of growth of collection, depth of indexing, size of terminology, number of professional and non-professional personnel, input processing time, search time, degree of mechanization and the nature of the contents of the index file. Licklider (120:36-39) lists ten criteria which include: handle both documents and facts, have several categories of input, converse with the user, have a variety of outputs and present flexible interfaces with other systems. Kent (114:85) divides his minimum criteria into two portions: the first part gives five general administrative criteria, scope of subject matter, variety of services, expandability of system, timeliness of the system and cost of operation; the second is made up of technical criteria such as file size, rate of input, and control.

Dugger (7:29) and Rees (147:175) have concerned themselves with a slightly different approach to the criteria or factors influencing

information centers in particular. Dugger provides four criteria to be considered for the establishment of a center: the amount of investigation being done and its prospects for growth, the significant lack of pertinent information in one place, the availability of research or technical investigation within the area, and the availability of engineers or scientists to man the centers. Rees summarizing the causes of information center success submits four propositions: 1) the success of the center is essentially related to the peculiar nature of the user group rather than the storage and retrieval system used, 2) the information center has not succeeded where the library failed - the application of the information concept to the provision of services for non-homogeneous and multi-missioned user groups will encounter the same problems as libraries, 3) the information center represents the physical embodiment of the invisible college, and 4) the role of the information center is to provide evaluative and interpretative information services within a specialized mission oriented group of knowledgeable users.

There do seem to be several broad categories into which these criteria or factors fall. For this review several of the categories will be discussed: the authority on which the organizations have been founded, the financial status and cost, the materials, the organization and administrative structure, personnel, services provided, and the user. Unlike the previous chapters, however, there will be less attempt to break the discussion down into type of information activity but rather there will be only two general treatments, the library, and other information activities. The latter assumes inclusion of all the others. Specific peculiarities will be brought out only when a special problem is concerned.

Authority:

Authority for and establishment and maintenance of federal libraries resides in five types of regulations: public laws, executive orders, decisions and regulation of regulatory officers and bodies, departmental regulations, and bureau regulations, orders, and procedures. They may also be governed or influenced directly by regulations of other servicing agencies such as the Civil Service Commission in regard to employment, or GSA for procurement contracts, GPO for printing services, etc. Except for the latter group, other servicing agencies, most of the authority statements are extremely broad and are for the most part based in the Public Law establishing the agency of which the library is a part. Some examples have already been cited on p. 1. These are fairly typical. The Organic Act of 1862 establishing the Department of Agriculture (193) set forth a basic mission to acquire and diffuse among the people of the United States useful information... The first commissioner in outlining the primary program included a library and a museum. From the Secretary of Agriculture Memorandum no. 1496, March 23, 1962 (41:316): "Accordingly, the Library of the Department of Agriculture is hereby designated, and shall be known as, the National Agricultural Library." The Federal Aviation Act of 1958, P.L. 85-726: Sec. 311. The Administrator is empowered to collect and disseminate information relative to civil

aeronautics. The Patent Office Library was first mentioned in an act of Congress in March 1839 when \$1000 was asked for the purchase of books. (175:271) The first statute to set up the Library of Congress was issued in January 1802 placing the president of the Senate in charge and creating the position of librarian. (170:253) This presents the general tone of authority in the establishment of libraries, broad generalization geared to collection and dissemination of materials, even for one of the most recent cited, that of FAA.

In contrast to this generality the directives establishing information, data, document centers are quite specific. P.L. 776 establishing the Office of Technical Services directs (92:219): "The Secretary of Commerce is hereby directed to establish and maintain a clearinghouse for the collection, dissemination of scientific, technical and engineering information; 1) to search for, collect, classify, coordinate, integrate, record and catalog, 2) to make such information available through abstracts, digests, translations, bibliographies, indexes, microfilm, and to effect removal of restrictions. Army Regulation 40-405, August 31, 1942 states (125:19): "The purpose of this institution is to select, purchase, index, catalog, and preserve all literature pertaining to medicine and the related sciences ..." The Space Act of 1958 provides (156:87): "to provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof. This is in reference to the National Aeronautics and Space Administration. The Clean Air Act of 1963 (193) authorizes the Secretary of Health, Education, and Welfare to collect and make available, through publication and other appropriate means, the results of research and other activities, and other information..." "and to collect and disseminate in cooperation with other private and public agencies ..."

Despite the considerable variation in the degree of detail in the authority the nature of the content does not vary much. Whether library or center all designate an interest in the literature, its generation, publication, dissemination. The generality may help to explain why some institutions such as the Library of Congress, National Agricultural Library and the National Library of Medicine, etc. find that placing an information center totally within the established structure was not as difficult as previously imagined.

Financial base and cost structure:

Any discussion of cost and finance base of either libraries or information centers-systems is extremely difficult. Literature on the subject is almost non-existent although the serious interest in the area is beginning to reflect in research. In the early days of libraries, especially those in the federal complex often the only mention of a library or a book appeared in legislation requesting funds to purchase materials. This implies the existence of a library but does not really firmly establish one. One typical example of this is illustrated: (198:1039) a request to Congress by the U.S. Geological Survey in 1901 "for the purchase of necessary books for the library and payment for transmission of public documents through the Smithsonian Exchange, \$5,620." Some 43 years later Keyes Metcalf (125:94) in a report on the "National

Medical Library" expressed another sad condition of most federal libraries: "For many years the Library has been starved financially. There was one period of nearly two years when only 16 books were purchased. At no time in the past generation have appropriations been large enough to provide the acquisition of all current publications ..."

Thus while the financial support for all federal information activities rests with Congress and the administration of each separate agency, it has apparently been the library which has suffered most from the lack of funds, and still does. In several instances of early efforts to do research in information handling especially in regard to automation the libraries have had to seek private, non-federal funds. Fortunately, once begun and to a certain extent proven, federal funds have been made available and general support has been enthusiastic.

Most libraries have been supported out of "overhead" funds and no one has ever really asked them to justify their existence. (93:135) As a result there are also no statistics available to indicate the costs involved in library operation. Librarians have not been for the most part management minded. They have kept a vast range of statistics but rarely has an in-depth study of cost resulted.

The information center-system has fared a bit better. John Sherrod (163:221) points out in discussing the feasibility criteria for establishing an information center that any information center can operate providing sufficient funds and personnel are committed. Dugger (71:31) has said that information centers are costly as far as manpower and dollars are concerned and that success will depend on the size of the population served. As the center succeeds the cost increases (use increases). The Mechanical Properties Center received 20 requests the first year, 400 the fifth year with an average cost per request ranging from \$150 to \$200 the first year and increasing to \$4000-\$8000 in the fifth year. One of the major reasons why the Chemical-Biological Coordination Center failed to survive was the lack of a stabilized support and the costs of per request service proved to be so high that service charges would not carry the burden. (70:190, 197)

This essentially implies that perhaps the center-system activities are not self-supporting and cannot hope to be because of the relatively small number of clientele who use them. Generally the information center has had little trouble establishing a need for its creation, and then for the support of system development. Most have developed outside the other information activities because of the readiness of agencies to support the expressed need of a specialized research group working primarily for the government. Some have been created within the structural framework of an established library, as is the case with the Pesticides Information Center at the National Agricultural Library, the National Referral Center at the Library of Congress but these are exceptions rather than the rule. Here again the support comes as special appropriation to satisfy a specific user need.

In other cases the federal government has supported the developmental aspects of information centers but has withdrawn support when they

become operational. To a large degree the centers have been unable to support their own activities no matter how vital and have either curtailed operations or ceased entirely. Thus it is noted that the vast majority of the information centers today are either totally supported or partially supported by federal funds, and hence according to our definition would fall within the scope of this report. Two prime examples of this influence are shown by the RICASIP Center at the National Bureau of Standards and the American Society of Metals, Metallurgical Information Center.

One of the best contributions to the literature of managerial cost accounting of information centers has just been completed at the Indiana University School of Business as a dissertation by J. Helmkamp. (95) This investigation identifies the major problem areas and explores a system and formula for the derivation of managerial costs. The dissertation shows a comprehension not just of the business aspects but somewhat surprisingly of the information handling problems which centers must face.

The information center-system regardless of type has had to justify its existence and continue to do so throughout its operations. As a result some managerial procedures are usually followed and there are more facts relating to cost than there are with libraries. Some of this also derives from a need to charge for user services. Whether or not the price structures are founded on fact, i.e. operational data, remains to be determined.

Materials:

Several statements have been made as to the type of materials found in information handling activities. They run from manuscripts (found in archival collections) to tape files of data. While sweeping generalizations probably do more harm than good in looking at libraries and information centers, and there are many exceptions, it is fair to say that libraries in most federal agencies are founded in books and book-type materials and their entire systems are keyed to bibliographic documents (excepting report literature), in other words printed materials or their facsimiles. This characteristic may be extended to the information center. The report of the Research Triangle Institute (100:13) lists the following materials of interest to an information center: technical reports, journal articles, books, review articles, abstracts, accession lists, bibliographies, news releases, formal meeting, discussions, and works in progress. The differentiation between library and information center does not really come in the type or form of the material but rather in what is done with it.

On the other hand there is a radical difference in the data or information analysis center such as the National Standard Data Reference System. (34) Here the material comes in the form of individual data items perhaps on punched cards, perhaps on tape but rarely in conventional book form. The Battelle Transducer Information Center (16) operates with a mixture using as a base research reports, test data and its evaluation, journal literature, and manufacturers trade literature and specifications. There are few operational systems handling purely data without using book type materials for input.

Organizational Structure and Administration:

Organization involves two separate principles which will be considered here, one the internal organization of the library and information center-system, and the second the idea of a national system of libraries and information centers, or a network. A great deal has been written in recent years about national systems and very little has been done. There seems to be a somewhat romantic aura about such discussion but there is some validity to the suggestions tendered thus far. While it is all projection and conjecture about the future, the talk does reflect current understanding of the role of the library and that of the other information elements.

In regard to the internal structure and administration of federal libraries, there is very little consistency. The library is found in many different places depending on the organizational concepts held by the administration. (101:26) In a few places it is part of the research division but this is unusual for a library, more common for an information center. There has been interest in making the library a more identifiable element by placing it directly under a deputy chief of the agency for administration, e.g. Health, Education and Welfare, Treasury, and Justice Departments. (The National Agricultural Library is a responsibility of the Director for Science and Education.) In some it will be found as part of a technical information office including many other activities.

One characteristic of federal agencies is fairly constant reorganization either to accommodate new functions or perform more efficiently and the libraries naturally figure in the re-allocation so that the relationship to the over-all administration shifts. One of the most outstanding trends has been the tendency to establish either centralized collection in one library or to develop planned networks. "The National Agricultural Library operates with an information service scope of responsibility that appears unique. In no other government agency is there such an extensive array of established components of an integrated information service network. In no other agency is there underlying legislation so well established and so well implemented for the establishment of cooperative programs administered by a single responsible department organization." (106:38) The National Library of Medicine is in the process of establishing a network but it is not the same type, or structured in the same fashion. The connected facilities are more information center operations. There has been an attempt to centralize many of the other federal library complexes such as Interior, Federal Aviation Agency, but the relationship of each unit to the other varies from very close to almost none. Some function as branches, some as almost independent libraries, merely reporting to a single authority.

From an administrative point of view the cause of centralization has been for more efficient use of available personnel, for more efficient operation, and for general cost reduction. Mumford (130:223) points out some of the influencing decisions associated with national libraries and the concept of centralization: "every national library must decide on centralization or de-centralization. It should be carefully planned - balancing the frequently cited advantages of tight administrative control, minimizing waste and lost motion, reduction of overhead

against the disadvantages of an unduly complex internal organization which lacks flexibility and is inherently cumbersome."

The federal information center operation is really quite different. In many cases it is part of the research and development unit of the agency. In the National Aeronautics and Space Administration the Director of the Scientific and Technical Information Division is responsible to the Administrator for Technology Utilization and Policy Planning, while the Science Information Exchange is responsible to the Office of the Secretary of the Smithsonian Institution. Many others especially the DoD Information Analysis Centers, e.g. those at Battelle Memorial Institute are structurally related to the research activity of the contracting organization. There is considerably less discussion of the internal organization and administration of the information centers than there is of the libraries and most appear well down in the hierarchy. In some cases the information center has grown up within the framework of the library such as with the National Referral Center (Library of Congress), the Pesticides Information Center (National Agricultural Library), and Toxicology Information Center (National Library of Medicine). This is a fairly unusual occurrence and while they are administratively part of the library they are in actuality, from an operating point of view, almost as separate as the other information centers, with separate and proportionately larger budgets, different types of staff, different resources, and they provide different services. The problem of centralization and decentralization does not appear since most of the centers are quite small as organizations and are either part of non-federal research organizations or are contained by a network of a federal agency, as in the case of NASA or AEC.

The external organization or concept of a network of libraries or centers within one agency is not really a new one. The earliest was that established by the Superintendent of Documents to provide collections of document materials throughout the U.S. This was accomplished by setting up depository libraries. "The table below provides an overview of numbers of depository libraries (as of 1963) receiving the documents of major S(cience) & T(echnology) agencies." (192:6)

<u>Agency</u>	<u>Number of agency depository libraries</u>
AEC	79
Agriculture Dept.	--
Commerce Dept.	158
Defense Dept.	6
FAA	--
HEW	--
Interior Dept.	10
Library of Congress	
S & T Division	--
NASA	57
NSF	--
VA	--

TECHNICAL RECOMMENDATIONS IN NATIONAL INFORMATION SYSTEM PLANS

RECOMMENDATION	Stafford	Crawford	Cahn	Weinberg	Manag. Tech.	Heller	Taubes	Kelley	Stimpson	Warten	Donner	Goldberg	Mayo-Wells	Kelley	Loebovitz-Album
Dev. standards															
Dev. educ. curricula															
Study req. for equip. & fac.															
User needs and character															
Dev. thesauri															
Increase use of auth. abstr.															
Dev. user statistics															
Expand research (info. sci.)															
Improve exist. publications															
Dissemination techniques															
Improve commun. technology															
Improve tech. writing															
Increase use of tech. eval.															
Assess sources of info.															
Assess vol. tech. publica.															
Conduct research improve professional mtgs.															
Consider kinds of info. proc.															
Dev. compatible coor. indexing															
Dev. theories info. stor./ret.															
Dev. stand. abstr. formats															
Increase ency. function															
Inventory ABI services															
Inventory lib. & prof. soc.															
Study copyright problems															
Study informal commun.															
Study prob. class./prop. info.															
Study prob. organs./code info															
Train users															

FIGURE 4

The concept was then extended first by the Atomic Energy Commission and then by the Department of Commerce when it arranged for document collections at regional centers and field offices through the Office of Technical Services. NASA has followed suit with a similar but much more extensive network. Agriculture has established some 25 field libraries with the main office at the National Agricultural Library controlling or providing the majority of administrative services. (128:44) The Army and the Air Force have maintained Special Services Library Service through a string of small libraries. Weinstock (205:334) indicates the value of external networks to the information agencies whether libraries or information centers: "The purpose of information networks is to assist libraries to be truly and ultimately responsible to the needs of the audience and permits the libraries to have access to and use the total national library resources."

The networks mentioned here are not the national systems described and advocated by such as the Weinberg report, the SDC study of national document handling systems, Stafford Warren's proposal or the several others in this vein. The ones presented here represent the state-of-the-art while these national schemes made up of many components are still all projected. The SDC study on national document handling systems contains a summary of the recommendations presented by these proposals (Figure 4). The proposals will be discussed in relation to the final chapter on the role(s) of the libraries and information activities.

Personnel:

The people who staff and operate libraries and information centers-systems mark one of the greatest differences between the two information handling activities and do the most to perpetuate and emphasize the separation. Despite the fact that the librarian has for a couple of centuries been the major information handling agent, a general feeling pervades today, that the librarian is either unable or unwilling to perform the tasks of the information center-system complex. A great deal has been written about manpower, education for, recruitment of personnel. Current research into the manpower problem is being done by the Graduate School of Library and Information Science at the University of Maryland. But while lack of manpower is recognized and it exists both for libraries and information centers, it is not this problem which separates the two. Generally speaking it is educational requirements both professional and disciplinary.

Data compiled by the Civil Service Commission listed some 6,068 full-time library and archives personnel as of October 31, 1962. (41:32) This does not include the people then working in documentation centers, data centers, clearinghouses or information centers since it essentially preceded the re-valuation of the classification series. Simpson (167:46) basing his facts on the National Science Foundation Directory lists 400 specialized information centers with some 13,000 personnel. This perhaps can give some idea of the size of the problem at hand. The dates are relatively the same. While admittedly the latter includes more than just the federal information center they do constitute the majority.

The federal library complex is largely controlled by Civil Service Commission requirements as specified in their Position-Classification

Standards (Feb. 1966) (181:2-3) and their Qualification Standards (March 1966) (182). These positions are divided into series (three in number):

- 1) Positions which primarily require a professional knowledge of librarianship and a broad knowledge of literature, equivalent to that represented by a graduate degree in Library Science, are classified in Librarian Series, GS1410. Also included here are positions requiring this paramount qualification in combination with knowledge of a subject matter field, language proficiency, knowledge of machine technology, or proficiency in administration.
- 2) Positions which primarily require a knowledge of one or more broad scientific fields or special subject matter areas, in combination with practical knowledge techniques, methods, or devices for processing documents and information services are classified in the Technical Information Services Series GS1412.
- 3) Positions in which requirement for specialized, professional, scientific or technical knowledge is paramount, and which have their career relationships in the subject matter field are classified to the appropriate subject matter series, e.g. Chemistry Series GS1320.

As one can see from the date of these publications this marks a rather radical departure from earlier descriptions and is a monument to the efforts of many federal librarians who have been trying for some time to integrate and delineate the problem of the librarian versus the documentalist or the information specialist.

The separation of librarian and information specialist is further explained by the following excerpts from the Librarian Series GS-1410 and the Technical Information Services Series GS-1412.

GS-1410 LIBRARIAN SERIES GS-1410

This series includes all positions involving work that "primarily" requires a full professional knowledge of the theories, objectives, principles, and techniques of librarianship. An inherent requirement of these positions is a knowledge of literature resources. Some positions also require a substantial knowledge of the subject matter involved and/or a substantial knowledge of foreign languages. Such work is concerned with the collection, organization, preservation, and retrieval of recorded knowledge in printed, written, audio-visual, film, wax, near-print methods, magnetic tape, or other media. Typical library functions include the selection, acquisition, cataloging, and classification of materials, bibliographic and readers' advisory services, reference and literature searching services, library management and systems planning, or the development and strengthening of library services.

The librarian occupation in Government involves selecting, acquiring, organizing and disseminating knowledge and information suited to the needs of the agency served and to the broader national and international communities to which the library has responsibility. This includes an understanding of the media through which knowledge is recorded and transmitted, and an understanding of the clientele, with ability to analyze their requirements, to anticipate future needs, and to provide interpretation and guidance in the use of pertinent information materials.

GS-1412 TECHNICAL INFORMATION SERVICES SERIES GS-1412

This series includes positions which are primarily concerned with the direction, administration, development, coordination, or performance of work involved in processing and transmitting scientific, technological, or other specialized information. Duties performed require a broad knowledge of one or more professional, scientific, or technical disciplines or fields of interest sufficient to understand the significance and relationships of the concepts and ideas contained in the information; a 'practical' knowledge of documentation or library techniques; and, in some cases, a knowledge of foreign languages.

This series does not include (a) positions requiring a professional knowledge of librarianship; or (b) positions primarily requiring professional knowledge and competence related to a specific discipline or field of interest, or a full knowledge of the state of the art, which have their career relationships in the subject-matter field.

The technical information specialist provides information services related to interdisciplinary or mission-oriented literature requiring utilization of a broad variety of knowledge gained through education or experience. For example, a position of Technical Information Specialist (Physical Sciences) concerned with indexing mission-oriented literature may require major study in chemistry and/or physics, plus substantial knowledge of one or more other subjects such as mathematics, electronics, geology, metallurgy, meteorology, astronomy, ceramics. The technical information specialist builds upon these broad and varied knowledges and develops an expertise in working with the literature of the specific field:

- (a) Technical information specialists typically serve in a document or information facility which is not a library, e.g., a documentation center or clearinghouse for the secondary distribution of technical reports. They are trained on the job, or in specialized training or educational courses, in the particular documentation

or information retrieval techniques used by the facility. A subject specialist, a librarian, a technical information specialist, or a program manager is responsible for administration of the document or information facility depending upon the needs of the organization.

- (b) Some technical information specialists serve as staff members of a library. They are trained on the job, or in specialized training or education courses, to perform specific library routines or techniques (e.g., in subject cataloging, indexing, reference or literature searching). A professional librarian typically is responsible for the library work performed or for the library program.

It should be noted that only in the Librarian Series is mention made of a specific degree level to be attained, "a graduate degree in Library Science"; the others require a "practical" knowledge based on special "training courses". In category three stated above, however, subject knowledge may also require a high level of graduate attainment depending upon the discipline.

In the general literature concerning information centers-systems there is continual emphasis on the need for scientists and engineers to staff the activity, but the controversy still lurks: train a librarian to handle the subject speciality, or train the subject specialist in the techniques of the librarian. Most have preferred the latter but it should be remembered that the subject specialist is learning only the "techniques". Peibly (146:5) goes even further to require that the specialists not only have years of experience but also be well regarded by their colleagues. They should have the opportunity to work in the lab to keep up. This point of view is upheld by Runck (153:158) in describing the arrangements at the Defense Metals Information Center at Battelle which is one of the DoD Analysis Centers. DMIC has 60 professionals, the library staff keeps the files and the technical people remain in their research divisions and spend 20% of their time on information retrieval. This is the only reference found which supported Weinberg's (195:33) contention that the information center should be a technical institute rather than a technical library, although the entire Battelle system is a living example.

Kent (115:82) provides a table which gives a summary cross-section of background related to tasks performed. This helps to strengthen the argument for separation. Much of the separation of duties and hence the tasks of the librarian and the information specialist as viewed by the literature resides in the belief that the former is responsible for the acquisition, control and retrieval of the physical objects (i.e. bibliographic control) and the latter with the subject content or data-informational content of the physical objects. The water is somewhat muddied by the information center which traditionally deals with both these aspects.

Background of Staff Members of Selected Centers

<u>Field of interest</u>	<u>What Analysis Performed</u>	<u>Number of Analysts</u>	<u>Background</u>
Radiation Detection	Abstracting, extracting, subject indexing, topic analysis	25	Physicists, Engineers
Mining and Mine Safety	Indexing, classifying	1	Librarian
Logistics	Abstracting, indexing by subject, source, author	3	Logistics, Data Processing
Ocean Sciences	Abstracting, extracting, indexing, classifying	2 Full time 6 Part time	Geophysical Sciences
All Sciences	Indexing, classifying, extracting, data checking	50 Non-technical 35 Scientists	General Research Scientists
Health Sciences	Indexing, classifying	1	Librarian
Standards	Indexing, classifying, evaluating	2	Physicists
Radiation Effects	Indexing, extracting	4	2 Information Scientists 2 clerk-typists
Nuclear Sciences	Extracting	8	Nuclear Physicists
Metallurgy	Abstracting, indexing, classifying	19 Part time 5 Full time	Metallurgists

FIGURE 5

Services:

Services are usually defined in terms of output, either physical in the form of a book, pamphlet, etc. or information in the form of an answer to a request. There has been a claim for a long time that the library has been a passive organization content only with preservation and serving only through the circulation of its materials. As a result the information center system was created to fill the needs of a community which demanded an active service through direct requests for data or information. Simpson (13:307) in his review article for the Annual Review of Information Science and Technology has quite ably summarized in parallel the information service activities of all communities which for the most part is applicable to the federal library-information center-system complex.

RELATIVE EMPHASIS OF INFORMATION SERVICE ACTIVITIES

Types of Information Services*	Functional Groups			
	Document Depot	Abstracting/ Indexing Service	Special Library (see Chapter 11)	Information Analysis Center
Passive acquisition	M	r	r	r
Active acquisition	r	M	M	M
Total storage	M	o	o	o
Selective storage	r	M	M	M
Reference searching	M	m	M	M
Retrieval	M	m	M	M
Hard-copy dissemination	M	m	M	m
Microcopy dissemination	M	m	M	m
Preparation of abstracts	m	M	r	r
Dissemination of abstracts	M	M	m	r
Preparation of indexes	m	M	m	r
Dissemination of indexes	m	M	m	r
Accession lists	m	m	m	r
Preparation of Bibliographies	M	m	M	m
Answers technical questions	r	m	m	M
Preparation and dissemination of analytical studies	o	r	m	M
Referral service	m	m	r	r

*M = major activity.

m = minor activity.

r = rare activity.

o = no activity.

FIGURE 6

This may be supplemented or in some cases merely detailed by the following which have been coded in the same fashion (17):

Functional Groups

Types of Information Services	Document Depot	Abstracting/ Indexing	Special Library	Analysis Center
Translation services	m	r	m	r
SDI	m	m	m	r
Review articles	o	o	m	o
Demand searches	M	m	m	M
Recurring Bibliogs.	M	o	r	o
Publication				
ann. bull.	M	M	m	r
rept. series	o	o	m	m
Data compilation	o	o	o	M
State-of-the-art	r	o	m	M
Literature search	M	m	M	o
Lending	r	o	M	o
Data evaluation	o	o	o	M

FIGURE 7

This review will make no attempt to evaluate services offered. There is of course considerable variation in quantity and quality (level) of service provided. Creager and Waite (106) have added as an appendix to the study of the National Agricultural Library network an appendix which contains an interesting matrix of services and their appearance in levels of information centers and libraries (Figure 8).

User:

The approach intended here is severely limited to the influence of, or the relation of the user to the library and the other information activities. It is not intended to cover the multitude of user studies and surveys which have appeared in the literature in recent years. Most of these have been ably reviewed by others especially in the Annual Review of Information Science and Technology (13). Herner (98:1) points out that one of the most serious hampers to the development and use of information storage and retrieval systems has been the tendency of the designers to think of the user as a constant. Information storage and retrieval systems serving the pure scientist are best designed as two stage operations in which the user is furnished bibliographical references and does his own selection, reading and interpreting of the items in the bibliography. The applied scientist on the other hand is best served by a one stage type in which the user is given actual answers to questions, rather than references. Borko (33:3) in discussing the evaluation of effectiveness of systems suggests one method (based on Calvin Mooers) oriented to user satisfaction. Basically this consists of having a user ask a question which becomes the basis for a library search. If the user is satisfied by the reference given him, the system is judged to be satisfactory. Obviously the difference here is that there is no way of knowing whether the search failed to uncover other pertinent references which are in the library. Conrad (54:111) lists several needs of the user-scientist: help in browsing, specific answers, knowledge of prior work, knowledge of what has not been done, knowledge of success and failure, who is working in the field, application, costs, facilities, status of competition and latent constraints. Most of these demands are highly specific in nature and are not provided by the more traditional libraries.

Rees (147:174) indicates that the information center user differs from the library patron in the degree of delegation which he is willing to assign. The library is searched by a trained librarian who furnishes a list of references or the documents themselves. The center searches, evaluates, synthesizes and the patron judges the search output. It is not too difficult to cater to a closed set of users as in a government sponsored information center. But there are grave problems if the scope is broadened. The existence of the unknown user with unpredictable information needs based on widely divergent languages, places a great strain on libraries. The success and vitality of the information center is largely due to the specialized nature of the user group rather than the system.

Several specific user studies have been made in relation to very limited groups. One of these was conducted by E.J. Feinler and others (78:330) and is reported in American Documentation. The study was conducted on a sample of 100 atomic and molecular physicists. The study attempts to measure the attitude of scientists toward the specialized center. Of these it was found that only 10% actually rejected the idea of the establishment of an information center. Most feared bureaucratic inefficiency, duplication of effort. The major concern was for promptness. He found that only DDC was used by more than 10% of the scientists. There was a definite clustering effect accounted for by the authors because of lack of adequate advertising. The two accompanying tables summarize his findings.

USE OF EXISTING INFORMATION CENTERS

Source	Used Frequently (more than 6 times annually)	Used Rarely (1-6 times or an unspecified number annually)	Never Used	Existence of Source Not Known
DDC (Defense Document- ation Center, for- merly ASTIA)	28	42	134	39
AEC Division of Tech- nical Information	9	22	169	43
NASA Office of Technical Information	9	20	169	47
OTS (Office of Technical Services) Dept. of Commerce	8	46	137	52
IGY World Data Center	6	9	162	6
National Referral Center for Science and Tech- nology (Library of Congress)	2	9	141	91
SIE (Science Information Exchange) Smithsonian Institution	1	5	125	112
U.S. Patent Office	1	14	201	27
Others	1	3

FIGURE 9

PREFERENCE FOR INFORMATION SERVICES

Types of Services	1st, 2nd, or 3rd Choice	4th Through 11th Choice	Omitted
Provide state-of-the-art reports	108	28	107
Provide bibliographies and special literature searches	106	42	95
Abstract current literature	90	22	131
Compile data sheets from literature (on request)	74	37	132
Provide mechanism to insure writing timely review articles	73	45	125
Obtain reprints (foreign & domestic)	68	29	146
Provide translation services	62	35	146
Provide continued surveillance of subject fields	62	33	148
Provide quick response to questions about technical content of current literature	57	32	154
Compile data sheets from literature (provided routinely)	57	22	164
Provide reference files for personal use	53	19	171

The Battelle study (17) has found in specialized science information services that it is the personnel in the applied research and development and basic research that are the most frequent users of information services. It also indicated that the majority, 76% of 442 respondents were most interested in the provision of a collection available for use by qualified visitors; 75% were interested in the answering of technical questions as a service; 64% in the provision of data compilations; 62% in information on current R & D; 54% in literature searching; 53% in consultant service; 52% in technical evaluation; 40% in leading documents; 39% in identification or location of materials. This study would then support to a limited extent that the library collection still ranks high among users in science and technology.

Thus it appears that the library user is essentially an unknown quantity, sometimes a potential user who has not yet come under the roof. The library because of its breadth of scope cannot predict in any fashion the type and quantity of information required and then must proceed with a rather arduous search for pertinent data, and then is left with the indirect approach to the information through the literature citation. The information center deals directly with the customer and for the most part will supply both documents (if attached to a documentation center or clearinghouse) and data. The scope is considerably narrowed and hence much easier to predict. The user suffers the most from lack of communication and awareness of the non-conventional information centers but is almost always familiar with the public library. In this sense good or bad if a user thinks to go outside his immediate circle for information the library may be the source.

VII. ROLE OF THE LIBRARY ...

Jesse Shera (162:163) in describing the emergence of a new institutional structure for the dissemination of specialized information presents the historical role of the library. "For 2000 years the library has been the handmaiden of scholarship, an ancillary agency disassociated in part from its cultural milieu by the larger institution to which it was attached. It was not immune but suggested contact with society was indirect and was responsible to the needs of the parent organization rather than the forces shaping the culture. During these two millennia libraries and books were the only resource of scholarship. The 17th century attempted cooperation and intercommunication of the science community but the library did not participate. Both scholars and students were book centered. Books were relatively few and periodicals just beginning. Completeness was the implicit objective of each library; scholarship was enormously repetitive and each collection was intended to be sufficient to itself". He outlines three factors which have characterized the change: growth of materials, change in form, and the change in the process of research.

This perhaps goes a long way toward explaining or defining the role the library plays at present. We have simply not moved into the modern times. William Knox (117:27) recognizes this change: an information service competes with the individuals' own sources of information. The users are adults with set patterns or habits. An outgoing, aggressive, use-oriented information service adapts the individual to change. It is often difficult to say just where a library leaves off and an information center begins; (84:302-3) some say it lies in the concept of service. But it is not really so much the fact that the library has failed but rather that a new need has been created and can be provided for by other means. Paul Howard (103:78) in defining libraries in the Federal Government indicates that the government looks on libraries as service organizations and they follow the structure of the agency they serve. Libraries need to define their roles in relation to the research of their agencies, many of which lack clear-cut missions.

On a more specific basis, that of individual libraries, Spofford (170:258) defines the role of the Library of Congress as the library for the American people--supported by legislation. It should furnish the fullest possible stores of information. Sherrod (174:82) further expands this by defining LC as a repository of the largest body of scientific information in the United States, probably in the world. It exists primarily to serve Congress and by extension other branches of government. It acts as a national library. Mumford (130:173) sees the role of LC in the scientific and technical complex as lying in the improvement of the effectiveness of communication between scientists and engineers. Mohrhardt and Oliveri (127:12) (National Agricultural Library) see the role of the federal library as one of support and stimulation, but that the individual library, even small groups of libraries, are no longer adequate for the general needs of the research worker, scientists and student. Schullian, in quoting the annual report of the Surgeon General (1872) (125:14) establishes the traditional role from the point of view of the medical library: "The library of the office ... is in effect a necessary

supplement to the Congressional Library. It should contain every medical work published in this country and every work relating to state medicine; for when legislation becomes necessary on these subjects, as it surely will, such a library will be indispensable, and it cannot be formed on short notice." Herzer (99:171) in reflecting upon the role of the small library pictures it as a salesman whose absence severely handicaps both scientist and engineer. It is not enough to make libraries more efficient or devise and install better or faster means of inter-library communication. Far more important than how our library resources are connected is what goes through the lines and how it is used.

The literature tends to imply thus that the role of the federal library lies in promoting effective communication, in the establishment of a comprehensive collection, and in servicing that collection. It is in this latter aspect that the various elements of the information community have begun really to separate and to assume more specialized roles. But it is also here that much of the overlap occurs. As the background information in the Civil Service Commission Position Classification Standard (181:4) summarizes: "Libraries are a link in the information cycle. Additionally, a variety of other information facilities closely related to libraries have been established for the purpose of collecting, processing, and distributing documents or data of a specialized nature. Depending upon the specific functions performed, these are designated as information centers, documentation centers, clearinghouses, information exchanges, etc."

The commission continues with the role of the new information activities: "These information facilities are playing an important role, particularly in support of programs in science and technology. They have been developed primarily to organize and exploit sources of information such as unpublished research reports, journal articles, pamphlets, reprints, and even smaller units of published or unpublished information."

The documentation center as represented by the Defense Documentation Center, the Clearinghouse for Federal Scientific and Technical Information (formerly the Office of Technical Services), the Atomic Energy Commission, Division of Technical Information, and National Aeronautics and Space Administration's Scientific and Technical Information Division come very close to the traditional information center concept with some additional functions. They have developed some very specific roles in the information complex. John Green (89:226) in presenting the role of the Department of Commerce states four roles: 1) see that all of the useful information is made available, 2) make sure the results of government research is supplied to the public, 3) provide a clearinghouse service for technical translations, and 4) to see that from whatever source, industry gets what it needs. In 1964 when the Office of Technical Services acquired a new name (139) and some new functions, its role was specified as: to serve as a central source for government research reports through a data-document distribution system, to serve as a single agency through which unclassified reports and translations are uniformly indexed and made available, and to provide information on federal research in progress through a referral service to the sources. Finally, the relationship of the Clearinghouse to other national information systems is to provide optimum availability of information in all fields, in published and unpublished information to scientists and engineers.

S. N. Alexander in hearings on National Information Centers (183) describes indirectly the role of the information center in relation to the library: "They (NIH, AEC) are attempting to deal with an area not normally dealt with by the average library or the average abstracting service. They are trying to deal with document literature which is material before formal publication. They have recognized the problem has a different character from the normal operation of a library service."

The data or information analysis center has a somewhat different role to play for it lacks most of the characteristic library functions which even the information center has retained. Darby (56:91) in his article on information analysis centers describes the role as: IAC serves to integrate the technical community into an information transfer net. The term information analysis has been coined to place an emphasis on the term analysis. The center provides a direct interface of technical specialist with the user audience and the information system. The Atomic Energy Commission has 24 such centers; NASA, NBS and others have recognized this vital role and begun to develop their own centers. A unique characteristic is that they are transitory and remain only as long as they are needed. The National Standard Reference Data System at the National Bureau of Standards has been designed to centralize a large part of the data compilation activities of a number of government agencies. The new system will provide crucially evaluated data on a national basis and develop a storehouse of standard reference data. Both the Department of Defense and the Department of Health, Education and Welfare support analysis centers as well.

The referral center or clearinghouse has another almost entirely unique role of an intermediary nature. The National Referral Center at the Library of Congress (122:264) is designed to provide coordinated access to the nation's resources in four areas of responsibility, identification of information sources, define the nature of these resources, provide guidelines and advice to any organization and to explore the roles and relationships that exist among these resources. The aim is to make more precise linkages between user and source of information.

There is one information activity which has not been mentioned at all in this entire review because it does not deal directly with the commodity itself. It does however play a considerable role in the information community. This organization is the National Science Foundation. NSF has been asked by Congress to assume leadership in the efforts to improve scientific information service inside and outside the federal government in the legislative acts of 1958 and 1959 (85:165). The National Defense Education Act of 1958 directed NSF to establish a scientific information service. "Briefly stated, the role of the Foundation is to identify and analyze the strengths and weaknesses in existing practices, and then take aggressive action both to develop solutions to present problems and support long term research looking toward development of new and improved techniques of information handling." More specifically this is accomplished by making grants and contracts, conducting studies and surveys, convening groups of many sizes, and reviewing gaps in service and areas of overlap. Coordination of national science information activities and coordination within the government have been displayed in the improvement in policy making and program planning in such as Science Information

Exchange and the National Institutes of Health, and among agencies with similar programs, e.g. Clearinghouse, Defense Documentation Center, National Aeronautics and Space Administration, Atomic Energy Commission, assisting in solving the present problems of scientific publishing and indexing and abstracting services, and developing new publishing systems for faster and more comprehensive information at the lowest possible cost. The role of NSF is thus coordination, sponsorship, and research in the scientific information community.

What of the interrelationship of these various roles of the information activities? While the literature in this area has been sparse it is not entirely lacking. In a report to the National Advisory Commission on Libraries, Myatt (158:24) explains: "Much that is familiar to librarians and library practice can be recognized in the component elements of the extra-library services we have discussed. The arts of the two classes intermix as do their resources, products, and services. A library's accessions in many cases provide resource material for an extra-library system--while the librarian may utilize an extra-library system's services or products, such as an abstract-index publication, in serving the needs of his patrons."

"It thus has seemed rather sterile to labor to differentiate extensively between libraries and extra-library systems. Some libraries and librarians are interested only in books and journals, some recognize challenge and merit in informal exchanges of documents, and some express very positive postures as information-oriented, active disseminators. If there are meaningful distinctions for this study, perhaps they may be viewed best from the flow patterns of human intelligence." "Library and extra-library systems can be treated as fraternal elements of the total endeavor associated with acquisition, conservation, and utilization of knowledge."

Murdock and Brophy (131:347) in comparing libraries and information centers place the basic difference in the scope of responsibilities. Many of their functions and hence their procedures are decidedly similar. The number of information centers will increase if the present trend continues, but radical changes in the relationship between libraries and information centers is not anticipated. They see the library as a primary support to information centers.

M. Bloomfield (26:111) supports their viewpoint: "The library supports the activities of the information center by providing for its acquisitions. The library can also provide assistance to the information center through its familiarity with information retrieval principles. The information center can rely on the library to provide it with indexing and abstracting tools which provide a means of access to related information. The library also supports the information center with its current awareness announcement bulletins."

Thus while objectives, functions, services, personnel, finance, users, etc. may show both overlap and distinct separation of the library and some of the other information activities within the federal complex, there is with the one exception cited above (Myatt), general agreement that each of the information activities, library through referral center,

does have a separate role to play. Nowhere is this expressed more clearly than in some of the literature describing, proposing, conjecturing, perhaps dreaming of, the national information system. Hoshovsky (102:316), in describing the approaches toward a national technical information system, outlines four major resources to draw upon:

- "1. Government R&D agencies and their documentation services. They include such activities as specialized information analysis centers; NASA's Information Facility, Defense Documentation Center, etc.
2. Government-wide R&D documentation systems. Included here we have the Office of Technical Services (recently renamed the Clearinghouse for Federal Scientific and Technical Information and placed under the National Bureau of Standards), National Referral Center, National Library of Medicine, Science Information Exchange, and similar entities whose main function is processing of documents or pointing a way to the documents (as contrasted with those entities which handle information as a part of actual R&D activity) in form of consultation and direct answers.
3. Specialized information centers. These groups vary widely both in size and the kind of service they furnish. Characteristically they are associated with sizable research institutes where experts evaluate the significance and pertinence of reported work to the subject area covered by the center.
4. Abstracting and indexing services. We refer here to the documentation services of both professional and technical societies, and commercial contractors (such as the one which prepares and publishes NASA's abstract bulletin). They are now our major announcement mechanism.

In proposing a system we assume that these four elements would be able and willing to divide the total work along the traditional functions of the documentation process (i.e., the acquisition, production of documents, abstracting, announcing, storage, retrieval, dissemination, etc.). Certain segments of this community have an established capability in one or another of these functions. Thus, we think of the government with its vast network of agencies, reaching practically into every corner of the globe, as best suited to insure an orderly collection of scientific papers and reports. We look upon professional societies and their documentation services as best suited for the task of abstracting, indexing and announcing the profession-oriented literature. Finally, we view the technical libraries and specialized information centers as the 'retailers' providing personalized service to their customers, and the main (but not the only) access to the whole of technical literature."

Vlannes (200:3) expands this somewhat beyond the federal system and foresees six interacting communities: federal agencies, academic communities, industry, professional and scientific societies, private organization, and the foreign community, into a complete, comprehensive

truly national system. The various characteristics, functions, etc. of the many plans are outlined in Figure 4, page 31 of this review.

The entire aim of the SDC study (41) of national document handling systems is designed to explore these proposed national systems and to make recommendations based on the present status, the present and future requirements, and several possible new approaches. These new approaches present roles of the library and other information organizations in several different attitudes, e.g. a new operating agency (amalgamate, coordinate, and provide, through an operating network, all federal document handling services), a government chartered corporation (essentially similar as the above only oriented to both federal and non-federal communities), and a National Library Administration (built on the existing organization within the federal government). Note the changing importance of the role of the traditional library concept from that essentially of a supporting activity in the first and second, to that of the basic foundation in the third.

VIII. CONCLUSIONS

In concluding this report the author feels that in order to get a composite picture, some generalizations are in order and perhaps too a glimpse into the future. As has been indicated in the introduction to this report, the role of a library or an information center must be determined in several ways: by definition, by function, by purpose, and by a variety of descriptive elements. In some the role may be specifically stated, but in most it is implied. If one were to try and compile a composite definition of the role of the library versus the information center (used generically to include the whole range of other information activities) by detailing distinctions or differences, this might be the result:

The federal library has a tradition of dealing primarily with books, or book-type materials. Its functions related to these materials involve the acquisition, collection, recording, organization, storage, retrieval and to a certain extent dissemination of materials. The library is for the most part discipline oriented but is inclined to be staffed by the professional, funded as an overhead item of the budget, and placed in a relatively low subordinate position in the organizational structure of the agency.

The federal information center has been characterized as dealing with information, data, or the contents of books. Its functions seem almost identical with those of the library: acquisition, collection, recording, organization, storage, retrieval and dissemination of this data or information. They are, however, usually extended to include some others oriented toward service particularly: compilation, creation and publication of information itself. The information center is apt to be mission oriented and hence supports the activities of a narrow and limited clientele. It is staffed by subject specialists with research background, funded as a special item in support of a particular program, and maintains relatively the same organizational position as the library.

Admittedly this is perhaps not the best way to define the role of one as opposed to the other. The intent here is to generalize and show at what points the major differences occur. These two composite views really represent the extremes and the true picture wanders back and forth between the extremes. We find the traditional library in some cases assuming the character of the information center and the information center in many cases assuming the character of the library. As a result perhaps, as Myatt has pointed out, the differences have been belabored. Regardless of what the conceptual role has been, the library and information center have very definitely in many cases developed separately.

Our answer may also lie in an examination from a slightly different point of view, one dealing with the term function. Walter Kee, Senior Technology Utilization Officer, Division of Technical Information, U.S. Atomic

Energy Commission in a letter related specifically to this report envisions the role as a relationship between wholesaler and retailer. The wholesaler provides services to a geographically dispersed community with broad interests. The services are provided indirectly to the ultimate user. The retailer provides personalized services to customers usually in a geographically defined area. The various types of information activities from the library to the data analysis center may fall either discreetly within one category but more likely in both. Most service functions are being provided solely on a retail basis. This is a rather interesting approach and definitely worthy of consideration, although it seems to come to somewhat the same conclusion as that developed on the basis on the composites above.

Another interesting approach to function which should be explored is one expressed by C. Walter Stone in "The Library Function Redefined" (Library Trends, October, 1967). He does not actually define what he means by library function but it is implied. The library function is that of collection, organization, storage and perhaps retrieval of materials ("media") as opposed to the information function (the author's label for Stone's unidentified function) which includes provision of access to recorded knowledge and communication services not related to specific media but to information (data) and service. This idea although taken somewhat out of context here perhaps holds the clue to the true role of one type of information activity as opposed to another. It has been made quite apparent in the literature that it is very difficult to separate the "library" from the "information center," perhaps less so with the data center. It has also been indicated that federal information activities have in some cases coordinated all aspects under one roof and that this trend is continuing.

The concept of the library function and the information function could be extended and superimposed on the federal information activities giving new meaning to the roles of each. The library function would involve the collection, acquisition, organization, maintenance, storage and retrieval of either materials or information. The information function would involve the evaluation, compilation, creation, publication and dissemination of either materials or information. Most library-information agencies or organizations provide both at present with the single exception of the data analysis center which falls into the latter.

The role of the library in relation to the other information activities thus takes on an entirely different cast than that indicated by the literature. The library becomes only one of several vehicles performing similar functions. The fact that the vehicle has been called a library traditionally should not necessarily contaminate our concept of information handling. Here again W. Stone in visualizing the library of the future states:

"The point is that in the future it will probably be less and less necessary to have all the pieces of a library program in one place so long as the program parts can be linked together in networks and the resources of each part deployed to support an over-all system. The library of the future is not wisely conceived of as a place at

all, but rather as a far-flung network composed of units of various sizes and types, each of which may perform similar as well as different functions... Within the system at any one time will be vestiges of past service programs for both the bibliophile and the antiquarian; but there will also be avant-garde approaches to the use of communications technology..."

"In conclusion...what will be important is the library function, not the library as a physical institution."

Becker and Olsen (13:v.3:304) continue this a bit further:

"Technology and public demand are rapidly pushing libraries into accepting new organizational responsibilities and performing functions that have been left previously to other communications media. The conservative nature of large library systems has kept them from extensive innovation and experimentation, as is more common in industrial and research situations. Libraries, particularly at the national level, are now more concerned with structuring and standards for indexing schemes, making literature more readily and quickly available, establishing communication rates for data transmission, integrating the newer media into the mainstream, and other extra-library activities that increase the amount of information transferred. These concerns are vital to the growth and extension of information library hopes, and joint efforts will be necessary if they are to be achieved."

Thus while the lines and the differentiation between the role of the library and other information activities may seem definite to some at present and less definite to others, the library cannot legitimately, especially in the federal complex, be consigned to play merely the storehouse. Indications are that the libraries are moving toward the information center and the information centers are moving toward the libraries in all aspects. The distinctions are being worked out: personnel of both professional and subject expertise is coming into both, funds are being supplied on all levels, services are melding, users demands and their satisfaction center around not just materials but also information. The lines of demarcation are now disappearing and should continue to disappear. The whole concept of the library and the information center is changing and the answer seems to appear in systems or networks (made up of many parts whether labeled libraries, information centers, data analysis centers or clearinghouses). No one is yet quite sure of the character of the system or network.

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The bibliography of a state-of-the-art review forms the base of the entire study and its importance cannot be overemphasized. The following bibliography has been prepared in two parts to provide several access points to the literature. The first part is strictly alphabetical by author, either personal or corporate, and title. The citations in the text are keyed to the number which precedes each citation. The first two sub-sections contain material by form, bibliographies used as sources for the state-of-the-art, and directories which list the libraries and information centers-services-activities. The rest of the sub-sections are in alphabetical order. Under each heading the work which contributed significant information are cited. A work may, and often does, appear under several headings.

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Ann F. Painter
Graduate Library School, Indiana University

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13. ABSTRACT

Traditionally the library has been the repository of printed information and has assumed the responsibility for its acquisition, processing, storage, and dissemination. Since World War II, and more particularly in the last ten years other information activities have largely taken over some of the old functions. The purpose of this state-of-the-art is to establish on the basis of the literature the role the library plays in relation to these other information activities in the Federal Government and perhaps shed some light upon the reasons for the development of separate facilities. Some of the characteristics investigated include definitions, functions, objectives, organization, financial base, services, personnel, and the user. A two-part bibliography (Alphabetical and classified) supplements the text. (U)

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